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Acquisition of Acoustic Source to Augment Navy Sonars for Mapping Sound Speed and Temperature with Tomography

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LONG-TERM GOALS

My long-term goal is to get enough data from the ocean so that its physical and acoustically induced fluctuations can be understood from theories and models. I hope to use this information to help the Navy with its operations.

OBJECTIVES

I want to demonstrate that passive and active Navy sonars can be used to map the sound speed fields by means of acoustic tomography. The Navy puts sound into the water and has passive arrays, both towed and fixed, that could be used to measure the travel times of acoustic multipath for subsequent inversion for the sound speed field.

APPROACH

Previous research with eddy-resolving ocean models indicates that accurate tomographic maps can be made of the sound speed field with moving receivers whose locations have errors as large as a kilometer or more (Spiesberger et al., 1997). In order to collect such data from the Navy, a tape recorder will be built for a U.S. submarine. There are advantages in utilizing moving receivers because they provide a synthetic aperture which improves the spatial resolution of tomographic maps compared with those possible to obtain from the widely-spaced SOSUS stations that have been used before (Spiesberger and Metzger, 1992; Silivra et al., 1997, Fabrikant et al., 1998).

WORK COMPLETED

The Applied Research Laboratory at the U. of Texas has built the tape recorder for a submarine.

RESULTS

IMPACT/APPLICATIONS

Utilization of Navy sonars for tomographic purposes ought to yield an efficient and cost-effective way for the Navy to estimate the sound speed field at mesoscales. These maps and their errors ought to be useful for predicting acoustic sonar performance and reliability due to the oceanic scales resolved with the data.

TRANSITIONS

The possibility of transitioning this technology to the fleet has been discussed with SPAWAR and CMNOC.

RELATED PROJECTS

REFERENCES

Silivra, A. A., Spiesberger, J. L., Fabrikant, A. L. and Hurlburt, H. E. 1997: Acoustic tomography at basin scales and clock errors, IEEE Journal of Oceanic Engineering, 22, 143-150.

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PUBLICATIONS